DETAILED ACTION

1.   Pending claims for reconsideration are claims 1-13.

Allowable Subject Matter

2.   Claims **9-13** are allowed.

3.   The following is an examiner's statement of reasons for allowance:

Regarding claim 9-10, the closest prior arts issued to Zavriyev(Patent No.:

US 7,606,731) in view of Bennet(patent Number:5,515,438) fail to teach or

suggest "performing a fine timing adjustment by incrementally scanning a

relatively narrow modulator activation signal over a timing interval centered about

the coarse timing value determined in; to establish a fine timing value that

corresponds to a change in an amount of non-quantum signals detected due to a

change in modulation of the non-quantum signal." Zavriyev and Bennet

combined simply offer a two way quantum key distribution system and active

compensation with non-orthogonal quantum key distribution method which uses

a beam splitter to split off a small fraction of the modulated signal for minor

measurement where the major measurement is performed by detecting two

pulses S and R in two separate square law detectors and recording the result of

component intensity integrated over the pulse duration. Regarding claims 11-13,

the closest prior arts issued to Merolla in view of Bennet fails to teach or suggest

having first and second optically linked QKD stations a method of establishing

timing of first and second modulator activation signals VI and V2 and for a first

modulator MB in the first QKD station Bob and a second modulator MA in the

second QKD station Alice respectively, the method comprising: setting the

second modulator MA to a fixed modulation setting the first modulator MB to a

fixed modulation varying the first activation signal timing in a coarse increment

$\Delta T1$ about an initial timing T10 to establish a course timing T1C of the first

activation signal by observing a change in detector counts of exchanged non-

quantum pulses; varying the first activation signal timing by reduced timing

intervals $\Delta TR < \Delta T1$ about the coarse timing T1C to establish a fine timing T1F of

the first activation signal by observing a change in detector counts of exchanged

non-quantum pulses varying the second activation signal timing by coarse timing

intervals $\Delta T2$ about an initial timing T20 to establish a course timing T2C of the

second activation signal by observing a change in detector counts of exchanged

non- quantum pulses varying the second activation signal timing in reduced

timing increments $\Delta T2R < \Delta T2$ about the course timing T2C to establish a fine

timing T2F of the second activation signal by observing a change in detector

counts of exchanged non-quantum pulses setting the first activation signal V1 to

a relatively large initial width W1C" ; "setting the first activation signal to a

reduced width W1R < W1C"; setting the second activation signal V2 to a

relatively large initial width W2C; setting the second activation signal to reduced

width W2R<W2C." Merolla and Bennet combined simply offer an integrated

quantum key distribution system using single sideband detection with a quantum

key distribution system using non-orthogonal macroscopic signals where the

intensity/width can be relatively large and at the receiving end can be reduced via

a beam reducer.

Any comments considered necessary by applicant must be submitted no

later than the payment of the issue fee and, to avoid processing delays, should

preferably accompany the issue fee. Such submissions should be clearly labeled

"Comments on Statement of Reasons for Allowance."

Response to Arguments

4.   Applicant's arguments filed 02/19/2010 have been fully considered but

they are not persuasive.

In the remarks, applicant argues in substance:

a.   *That-* Claims 1, 9 and 11 are tied to a particular machine--namely, a QKD

system. The various acts in the claims define a way of establishing timing

of first and second modulators in the QKD system (i.e., the "machine)

using "modulator activation signals," "exchanged non-quantum signals"

and "detector counts." The established modulator timing is a physical

result based on the operation of components of the QKD "machine"(pg.4).

In response to applicant's argument- The Rejection of **claim 1, 9, and**

11 under 35 USC 101 as allegedly not falling within one of the four

statutory categories of invention have been **withdrawn in light of**

applicants arguments.

b.   ***That-*** Zavriyev does not include any disclosure or information relating to

establishing the timing for the first and second modulators, including

setting the first and second modulators to a fixed modulation and

incrementally scanning modulator activation signals while transmitting

non-quantum (optical) signals in the process of establishing modulator

timing.

In response to applicants argument- Zavriyev discloses establishing

timing for a first and second modulator to a fixed modulation. Two

Quantum signals QS' and QS" encounter a PM coupler which splits each

signal in two creating for quantum signals where the two signals of QS'

pass through phase modulator PMB1. The phase modulator is activated

to impart the signal into a random phase which is accomplished by via a

timed gating pulse GPB1 from the controller as disclosed in Col.6 lines 31-

Col.7/lines 13 also illustrated in figure 1. Zavriyev further discloses in

Fig.4 a control signal CS which precedes the quantum pulse where it is

used to trigger the timing/synchronization scheme between Alice and bob

controller via a channel link [Col.7/lines 43-51]. Zavriyev does not explicitly

disclose the feature of incrementally scanning modulator activation signals

while transmitting non-quantum (optical) signals in the process of

establishing modulator timing. Bennet was introduced and disclosed a

non-orthogonal quantum key distribution method using a beam splitter to

split a small fraction of the modulated signal for minor measurement

where the major measurement is performed by detecting two pulses S and

R in two separate square law detectors and recording the result of

component intensity, integrated over the pulse duration as disclosed in

Bennet [Col.6/lines 4-20] and Bennet Figure.1. it is the combination of

Zavriyev and Bennet that teaches the claimed invention, not Zavriyev or

Bennet alone (see 103 rejection below for claim 1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for

all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described
> as set forth in section 102 of this title, if the differences between the subject matter sought to
> be patented and the prior art are such that the subject matter as a whole would have been
> obvious at the time the invention was made to a person having ordinary skill in the art to which
> said subject matter pertains. Patentability shall not be negatived by the manner in which the
> invention was made.

Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Patent No.: US 7,606,371 B2 to Zavriyev et al (hereafter referenced as

Zavriyev) in view of Patent Number: 5,515,438 to Bennett et al (hereafter

referenced as Bennett).

Regarding **claim 1**, Zavriyev discloses "A method of establishing timing for first

and second modulators in a quantum key distribution (QKD) system"*(see phase*

modules [Fig.1/items 104A and 104B] also see phase modulators PMB1 and

timed gating pulse GPB1 [Col.7/lines 1-10]), "comprising: setting the second

modulator to a fixed modulation"*(a fixed relationship/modulation is*

maintained between modulated signals [abstract]); "setting the first modulator

to a fixed modulation" *(a fixed relationship/modulation is maintained between*

modulated signals [abstract]), Zavriyev does not explicitly disclose

"incrementally scanning an activation signal for the first modulator over a range

of timing values to determine the first modulator activation signal timing based on

a change in detector counts of exchanged non-quantum signals; and

incrementally scanning an activation signal for the second modulator over a

range of timing values to determine the second modulator activation signal timing

based on a change in detector counts of exchanged non-quantum signals."

However, Bennett in an analogous art discloses a non-orthogonal quantum key

distribution method which uses a beam splitter to split off a small fraction of the

modulated signal for minor measurement where the major measurement is

performed by detecting two pulses S and R in two separate square -law

detectors and recording the result of component intensity, integrated over the

pulse duration *(Bennett [Col.6/ lines4-20] also see Bennett [Fig.1]).*

Therefore, it would have been obvious to one of ordinary skill in the art at

the time the invention was made to modify Zavriyev's two-way Quantum Key

Distribution system and active compensation with a non-orthogonal quantum key

distribution method which uses a beam splitter to split off a small fraction of the

modulated signal for minor measurement where the major measurement is

performed by detecting two pulses S and R in two separate square -law

detectors and recording the result of component intensity , integrated over the

pulse duration as suggested by Bennett *(Bennett[Col.6/ lines4-20] also see Bennet[Fig.1])*.

Regarding **claim 2** in view of claim 1, the references combined disclose "wherein the QKD system is a two-way system" *(two-way actively stabilized QKD system Zavriyev [abstract]),* "and the first and second modulators are phase modulators" *(Alice phase modulator Zavriyev [see Fig.1/PMA] and Bob phase modulator Zavriyev [See Fig.1/PMB1).*

Regarding **claim 3** in view of claim 2, the references combined disclose "wherein the first modulator is in a first QKD station (Bob) that generates the non-quantum signals, the second modulator is in a reflective QKD station (Alice) that reflects the non-quantum signals back to the first QKD station"*(Alice phase modulator Zavriyev[see Fig.1/PMA] and Bob phase modulator Zavriyev[See Fig.1/PMB1),* "and wherein the method further includes: discerning between two timing intervals associated with non-quantum signals entering and leaving the first QKD station to ensure that only non-quantum or quantum signals entering the first QKD station are modulated by the first modulator"*(Zavriyev[Fig.4] discloses timing of quantum signal(QSI) and control signal(CS) Zavriyev[Col.3/line42-45]).*

Regarding **claim 4** in view of claim 1, the references combined disclose "wherein the activation signals for the first and second modulators provide respective modulations that result in a maximum change in detector counts when the exchanged_transmitted non-quantum signals experience a change in modulation"*(Zavriyev[Fig.5/item 112] discloses the detection stage for the*

first and second signals of first and second modulators

Zavriyev[Col.7/line54-63], non quantum signal or the control signal follows

the same path as the quantum signal during the detection stage

Zavriyev[Col.7/line 14-22]),

Regarding **claim 5** in view of claim 1, the references combined disclose

"wherein the activation signals for the first and second modulators provide

respective modulations that are not basis modulations associated with

establishing a quantum key", *i.e. activation signals provide modulation not*

associated with the quantum signal(the control signal follows the same

path as the quantum signal and is modulated and divided into two signals

in the same manner as the quantum signal during the detection stage

Zavriyev[Col.7/line 19-23]),

Regarding **claim 6** in view of claim 1, the references combined disclose

"wherein the detector counts occur in first and second detectors, which are

arranged so that constructively interfered non-quantum signals are detected in

the first detector and destructively interfered non-quantum signals are detected in

the second detector" *(Zavriyev[Fig.5/item 112] discloses the detection stage*

for the first and second signals of first and second modulators

Zavriyev[Col.7/line54-63], non quantum signal or the control signal follows

the same path as the quantum signal during the detection stage

Zavriyev[Col.7/line 14-22]),

Regarding **claim 7** in view of claim 1, the references combined disclose

"including for each modulator: establishing a coarse timing interval"

(Zavriyev[Fig.3a-3b] disclose I vs. time intervals also see

Zavriyev[Col.3/lines38-41]); "dividing up the coarse timing interval into a

number of sub-intervals", *i.e. timing signal is split into multiple signals(see*

gating pulses GPA and GPB (Zavriyev[Col.8/lines25-32]); "and

incrementally scanning the sub-intervals to establish a more accurate

modulator timing"*(central interference pulse can be detected from quantum*

signal Zavriyev[Col.8/line25-32]).

Regarding **claim 8** in view of claim 7, the references combined disclose

"including reducing a width of the activation signal for each modulator" *(Variable*

attenuator can attenuate the signals Zavriyev [Col.5/line16-22] also see

Fig.2A).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of

time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire

THREE MONTHS from the mailing date of this action. In the event a first reply is

filed within TWO MONTHS of the mailing date of this final action and the advisory

action is not mailed until after the end of the THREE-MONTH shortened statutory

period, then the shortened statutory period will expire on the date the advisory

action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be

calculated from the mailing date of the advisory action. In no event, however, will

the statutory period for reply expire later than SIX MONTHS from the mailing

date of this final action.

Any inquiry concerning this communication or earlier communications from

the examiner should be directed to MICHAEL ANDERSON whose telephone

number is (571)270-5159. The examiner can normally be reached on Monday-

Friday 8am til 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the

examiner's supervisor, Kieu-oanh(Krista) T. Bui can be reached on (571)272-

7291. The fax phone number for the organization where this application or

proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from

the Patent Application Information Retrieval (PAIR) system. Status information

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free). If you would like assistance from a USPTO Customer Service

Representative or access to the automated information system, call 800-786-

9199 (IN USA OR CANADA) or 571-272-1000.

/KIEU-OANH BUI/   MICHAEL ANDERSON
Supervisory Patent Examiner, TC 2400   Examiner, Art Unit 2433